

MONKEY SPRING FLOW MONITORING QUARTERLY REPORT (Q1 2017)

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I. INTRODUCTION

Hudbay purchased the Sonoita Creek Ranch property in support of natural resources mitigation for the impacts anticipated from the Rosemont Copper Project. A significant element of the mitigation plan at Sonoita Creek Ranch is the existing constructed irrigation system which utilizes perennial flows from Monkey Spring, which is located on the property immediately north of Sonoita Creek Ranch. Hudbay contracted WestLand Resources, Inc. (WestLand) to design and install a flow monitoring station within the irrigation canal upstream of the two onsite ponds to ascertain the volume and regularity of flow reporting to the Sonoita Creek Ranch irrigation system. The flume installation was completed on April 30, 2015. This report contains the data collected for the months of January through March 2017.

2. SITE DESCRIPTION

The property is located in eastern Santa Cruz County between the towns of Sonoita and Patagonia. Sonoita Creek Ranch is located east of State Road (SR) 82, approximately 6 miles south of Sonoita. The primary water source, Monkey Spring, is located on a neighboring property. The released flow from the neighboring property flows into a partially lined irrigation channel running from north to south on the Sonoita Creek Ranch property.

From previous discussions with the neighboring property owner, it was brought to WestLand's attention that an additional water source can contribute flows to the monitored irrigation channel as well. The neighboring property has an irrigation system with flows coming from a separate spring called Cottonwood Spring. The irrigation system includes a ditch which can overflow into the Monkey Spring irrigation ditch. Although reported as a rare occurrence, it is possible that flows from Cottonwood Springs are captured by the flow monitoring station and in the data reported.

3. WATER RIGHTS OVERVIEW

The water rights associated with Monkey Spring are quantified by Certificate of Water Right No. 33-26063.0001 (the Certificate of Water Right). This document represents that Monkey Spring produces 255.793 million gallons (MG) (785 acre-ft) per year for irrigation purposes and approximately 0.657 MG (2.02 acre-ft) per year for stock watering uses. This amounts to a total of 256.45 MG (787.02 acre-ft) per year. According to the "Agreement Regarding Water Rights" signed on June 11, 2012, Sonoita Creek Ranch is entitled to 75 percent of the quantity of water represented by the Certificate of Water Right or such ratable, lesser amount in the event that Monkey Spring produces less water. Given the expected spring production, Sonoita Creek Ranch is expected to receive 192.338 MG (590.27 acre-ft) per year. The adjacent property owner retains rights to all remaining water from Monkey Spring comprising 25 percent of the quantity of water represented by the Certificate of Water Right plus any surplus water actually produced by Monkey Spring. Additionally, the "Agreement Regarding Water Rights" sets a water delivery schedule, as represented

in **Table 1**. Both parties that signed the agreement acknowledged that historically Monkey Spring has produced more water than stated on the Certificate of Water Right, so that compliance with the schedule in **Table 1** effectively meets the 75 percent diversion requirement.

Table 1. Schedule of Monkey Spring Water Delivery

Day	Times for Delivery to Sonoita Creek Ranch	Times for Retention by Adjacent Property Owner
Monday	12:00 am to 1:00 pm (13 hours) 4:00 pm to 12:00 am (8 hours)	1:00 pm to 4:00 pm (3 hours)
Tuesday	12:00 am to 7:00 am (7 hours) 4:00 pm to 12:00 am (8 hours)	7:00 am to 4:00 pm (9 hours)
Wednesday	12:00 am to 7:00 am (7 hours) 4:00 pm to 12:00 am (8 hours)	7:00 am to 4:00 pm (9 hours)
Thursday	12:00 am to 7:00 am (7 hours) 4:00 pm to 12:00 am (8 hours)	7:00 am to 4:00 pm (9 hours)
Friday	12:00 am to 7:00 am (7 hours) 4:00 pm to 12:00 am (8 hours)	7:00 am to 4:00 pm (9 hours)
Saturday	12:00 am to 7:00 am (7 hours) 12:00 pm to 12:00 am (12 hours)	7:00 am to 12:00 pm (5 hours)
Sunday	12:00 am to 12 am (24 hours)	none
Total Hours	124 Hours	44 Hours

4. DATA COLLECTION AND OBSERVATIONS

The data logger at the Monkey Spring flow monitoring station is programmed to take a data point every 15 minutes. Once every three months, this data is downloaded and the flume cleared of any obstructions. **Table 2** provides a summary of the data collected to date.

Table 2. Data Summary

Description	Q1 2017 Data	12-Month Record to Date**	Totals Recorded to Date**
Date Range	January 1 – March 31, 2017	April 1, 2016 – March 31, 2017	April 30, 2015 – March 31, 2017
Duration	3 months	12 months	23 months
Number of Data Points Logged *	8,622	34,921	66,863
Average Flow Recorded	376.5 gpm (1.66 afd)	409.8 gpm (1.81 afd)	397.3 gpm (1.76 afd)
Maximum Flow Recorded	1,089.8 gpm (4.82 afd)	2,681.0 gpm (11.85 afd)	2,681.0 gpm (11.85 afd)
Minimum Flow Recorded	0 gpm	0 gpm	0 gpm
Cumulative Volume Recorded	48.806 MG (149.78 acre-ft)	215.580 MG (661.59 acre-ft)	401.127 MG (1,231.01 acre-ft)
Cumulative Volume Expected Per Water Rights Agreement	47.388 MG (145.43 acre-ft)	192.184 MG (589.79 acre-ft)	369.361 MG (1,133.53 acre-ft)
Volume Difference Between Expected and Recorded	+1.418 MG (4.35 acre-ft)	+23.396 MG (71.80 acre-ft)	+31.766 MG (97.49 acre-ft)

Gallons per minute (gpm); Acre-ft per day (afd)

* Excludes data points removed from the set due to unrealistic flow readings as discussed below.

** The flow totals recorded in the Q2 2016 report had a spreadsheet error which has been corrected. The totals in this report capture the correction.

The data in **Exhibit 1** is presented as flow over time and cumulative flow over time during the current data period (Q1 2017). The vertical gridlines on these graphs occur at midnight of each day. For this data period, oscillations in flow data ranging between 200 gpm and 1,000 gpm were observed within the first 10 days of the quarter. During a site visit on January 10th, dead Russian thistle (*Salsola tragus*) was caught in the flume and removed. It is likely that the plant material caused some of the fluctuations in flows measured within the first 10 days of the quarter.

There were approximately four times within the quarter where flow rates dropped below 50 gpm for over a 24-hr period, likely the result of diverted flows from the neighboring property. Consistent flows around 600 gpm were recorded from January 13th through January 23rd, indicating that the neighboring property was likely not diverting flow. Between late January and early March, flows decreased to around 400 gpm with some flow spikes of up to 1,017 gpm recorded around February 14th. During February and March, extreme losses in flow appeared to occur during the daytime hours of 9:00 am to 3:00 pm on weekdays (Monday through Friday). During the month of March flows averaged between 300 gpm and 400 gpm.

According to Certificate of Water Right No. 33-26063.0001, Monkey Spring produces an average of at least 487.6 gpm (equivalent to 787.02 ac-ft per year). Sonoita Creek Ranch is entitled to 75 percent of this quantity, equivalent to 365.7 gpm. Using this entitlement as the expected average flow at the monitoring station, the cumulative volume expected over the analyzed period (Q1 2017) is 47.388 MG (145.43 acre-ft). The cumulative volume recorded over the period was 48.806 MG (149.78 acre-ft),

resulting in an excess of 1.418 MG (4.35 acre-ft). This comparison is represented graphically over time in the lower graph of **Exhibit 1**.

Eighteen (18) collected data points were excluded from the data set due to abnormally high readings. The maximum flow that the installed 12-inch 45° SRCRC Trapezoidal Flume can accommodate is 2,766 gpm at a water level of 1.21 feet. The eighteen excluded data points showed flows near or above this maximum, without a gradual rise in flow, indicating that something may have been temporarily caught in the flume, blocking the ultrasonic sensor. The Russian thistle cleared from the flume on January 10th could have contributed to the large fluctuations in flow readings within the first 10 days of the quarter; however, the measurements rarely exceeded 1,000 gpm and were therefore not excluded. The flume was thoroughly cleaned and calibration tests were conducted to ensure proper operation. This was the first time that a blockage of the flume had been witnessed firsthand. Although blockage is rare due to the open design of the flume, it is possible for debris to become lodged and produce inaccurate readings.

5. CONCLUSIONS

The data collected for Q1 of 2017 demonstrated boundaries, trends, and seasonal fluctuations for the flow seen at the Monkey Spring monitoring station. Some conclusions that can be drawn include:

- Monkey Spring continues to produce a maximum of approximately 600 gpm of flow (as reported at Sonoita Creek Ranch). As expected, this is higher than the Certificate of Water Right allocation of 487.6 gpm.
- During Q1, slightly more than the expected volume of flow based on the Certificate of Water Right was reported. The total excess of 1.418 MG (4.35 acre-ft) occurred because of multiple periods where the neighboring property did not divert all of the flow. This is a smaller excess than was recorded during Q1 of 2016 (7.983 MG).
- During Q1 of 2017, there was a set of unusually high flow recordings which likely indicates some temporary clogging of the flume, possibly from the Russian thistle in the beginning of January. The uncommon data points do not significantly alter the overall volume of water being recorded; however, those points that reached or exceeded the maximum flow limit for the flume of 2,766 gpm were removed from the recorded data and flow totals. The flume will continue to be monitored and cleared of any obstructions every three months.
- During the 12-month record to date (April 1, 2016 to March 31, 2017), more than the expected volume of flow based on the Certificate of Water Right was reported. The cumulative volume recorded was 215.580 MG (661.59 acre-ft) which is 23.396 MG (71.80 acre-ft) more than the expected volume of 192.184 MG (589.79 acre-ft).

Although temporary blockage was observed, the flow meter continues to function adequately.

EXHIBIT I

